

PATENT ABSTRACTS OF JAPAN

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(71)Applicant : DAIKIN IND LTD
SANKO GOSEI KK

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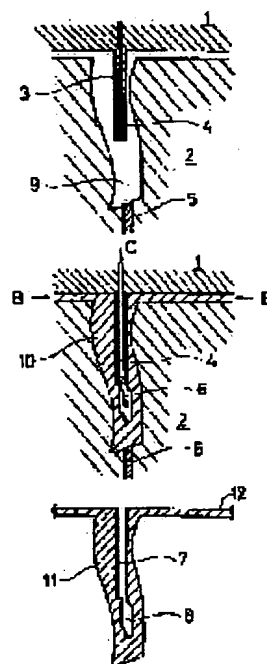
(72)Inventor : HARAGUCHI KAZUYA
MITSUSHIMA TOSHIO

(54) TURBO FAN AND ITS INJECTION MOLDING METHOD

(57)Abstract:

PURPOSE: To reduce a molding time, improve producibility, and reduce weight of mold by forming a projection on a die in order to form a theft on a blade, and forming a hollow space on a leading end from the theft of the blade.

CONSTITUTION: A thermosetting resin 10 is injected from an injection nozzle and flowed into set die in the direction indicated by arrows B or B'. A projection 3 is formed on a lower die 1, so that a thick portion of a mold is reduced compared to a conventional case. Fluidity of the thermosetting resin 10 is euqlized to perform even flowing of the resin in all of the due. After completion of the resin flowing, press-fitting gas is charged through a gas tube 4. Due to the press-fitting, the thermosetting resin 10 is brought into close contact up to a leading end of a plate recession 9. Molding time can be reduced by dispensing with a pressurizing process, and producibility is improved.



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CLAIMS

[Claim(s)]

[Claim 1] It is the injection-molding approach of the turbo fan which prepares a lobe (3) in metal mold (1) in order that a primary plate (12) and a blade (11) may prepare meat NUSUMI (7) in a blade (11) in the injection-molding approach of the turbo fan really fabricated with thermoplastics, and is characterized by carrying out blow molding of the tip side with injected gas (6) from above-mentioned meat NUSUMI (7) of a blade (11).

[Claim 2] The depth of above-mentioned meat NUSUMI (7) is the injection-molding approach of the turbo fan of claim 1 characterized by considering as about 1 of height of blade (11)/2 - abbreviation 2/3.

[Claim 3] The turbo fan with which a primary plate (12) and a blade (11) are characterized by having prepared meat NUSUMI (7) in the blade (11), and preparing the centrum (8) formed in the tip side of blow molding from above-mentioned meat NUSUMI (7) of a blade (11) in the turbo fan really fabricated with thermoplastics.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the injection-molding approach of the turbo fan used for an air-conditioning machine etc., and its turbo fan.

[0002]

[Description of the Prior Art] In the turbo fan used for an air-conditioning machine etc., it is required from viewpoints, such as low-cost-izing or increase in efficiency of a rotation drive, that lightweight-ization should be attained. Therefore, the thermoplastics which carried out

heating fusion is conventionally extruded to metal mold the shape of a pipe, and in the shape of [of two sheets] a sheet. The blow molding method which blows air from the center of a dice, is made to stick resin to metal mold, and fabricates the interior in midair. Or lightweight-ization of a turbo fan has been attained using low-pressure-molding methods, such as a foaming method which uses as a molding material what mixed in the shaping pellet of resin the strong liquid of ***** which hardly melts resin, such as butane, a pentane, and a hexane. moreover, the thing for which a corner R is prepared in the square corner section of a blade and a primary plate, and thickness of this corner R is made uniform like a turbo fan given in JP,4-116698,U as what is depended on the usual fabricating method -- there were some which prepare a hollow between the corner Rs of a pair and aim at reduction of a resin ingredient.

[0003]

[Problem(s) to be Solved by the Invention] By the way, in the turbo fan (refer to drawing 2) with which the primary plate 12 and the blade 11 were really fabricated, a blade 11 serves as a heavy-gage part of mold goods at the time of the shaping. Therefore, the fluidity of the resin within metal mold did not become homogeneity, resin flowed into the blade 11 previously by the conventional describing [above] low-pressure-molding method at the time of a resin inflow, therefore lightweight-ization by the short-shot method had the problem that it was difficult and shaping took time amount.

[0004] Moreover, in the usual injection-molding method, when meat NUSUMI tended to be prepared in the blade 11 which is the heavy-gage part of mold goods and it was going to attain the lightweight-ization, extent which establishes a hollow in root Motobe of a blade 11 became a limitation from the problem on metal mold reinforcement like a turbo fan given [above-mentioned] in JP,4-116698,U, and there was a problem that lightweight-ization could not fully be attained.

[0005] It is made in order that this invention may solve the above-mentioned conventional fault, and that purpose is to offer the injection-molding approach of the turbo fan which can attain lightweight-ization of mold goods, and a turbo fan while shortening cycle time and being able to improve it in productivity.

[0006] Then, the injection-molding approach of the turbo fan of claim 1 and a turbo fan form a lobe 3 in metal mold 1, in order to form meat NUSUMI 7 in a blade 11 in the injection-molding approach of a turbo fan that a primary plate 12 and a blade 11 are really fabricated with thermoplastics, and it is characterized by carrying out blow molding of the tip side with injected gas 6 from above-mentioned meat NUSUMI 7 of a blade 11.

[0007] Moreover, the injection-molding approach of the turbo fan of claim 2 and the turbo fan are characterized by making the depth of above-mentioned meat NUSUMI 7 into about 1 of height of blade 11/2 - abbreviation 2/3.

[0008] Furthermore, it is characterized by for the injection-molding approach of the turbo fan of claim 3 and the turbo fan having formed meat NUSUMI 7 in the blade 11 in the turbo fan with which the primary plate 12 and the blade 11 were really fabricated with thermoplastics, and forming the centrum 8 formed in the tip side of blow molding from above-mentioned meat NUSUMI 7 of a blade 11.

[0009]

[Function] By the injection-molding approach of the turbo fan of above-mentioned claim 1, meat NUSUMI 7 is formed in a blade 11 by the lobe 3 prepared in metal mold 1, and it is made to carry out blow molding of the tip side with injected gas 6 from this meat NUSUMI 7. Therefore, since the heavy-gage part of mold goods decreases, the fluidity at the time of a resin inflow equalizes and the resin by the side of the tip of a blade 11 sticks to metal mold certainly with injected gas 6 further, the need for dwelling decreases. Therefore, it becomes possible to shorten cycle time and to aim at improvement in productivity. Moreover, since the amount of resin decreases with reduction in a heavy-gage part, it becomes possible to attain lightweight-ization of the fabricated turbo fan.

[0010] Moreover, by the injection-molding approach of the turbo fan of claim 2, the depth of above-mentioned meat NUSUMI 7 is made into about 1 of height of blade 11/2 - abbreviation 2/3. Therefore, since it becomes only the point of a blade 11 that blow molding is carried out, it

hangs down, and it gets down, and the Barus effect accompanying this and the thickness deviation by the phenomenon can be reduced, and it becomes possible about fundamentality ability, such as a noise property, to maintain good considering the ** balance of the fabricated turbo fan as a stable thing.

[0011] Furthermore, with the turbo fan of claim 3, while forming meat NUSUMI 7 in a blade 11, the centrum 8 by blow molding is formed in the tip side from this. Therefore, while it is possible to decrease the amount of resin and to attain lightweight-ization, since ** balance is stable, it becomes possible to maintain basic properties, such as a noise property, good.

[0012]

[Example] Next, the concrete example of the injection-molding approach of the turbo fan this invention and a turbo fan is explained to a detail, referring to a drawing.

[0013] Drawing 2 shows the configuration of one example of the turbo fan of this invention, this drawing (b) is that plan and this drawing (a) is drawing showing that side-face **** central longitudinal section. In both drawings, 12 is the primary plate really fabricated with a blade 11 and thermoplastics, and the blade 11 of seven sheets is formed in top-face 12a spacing around about 50 degrees. And it inclines and each [these] blade 11 is arranged so that point 11a may be located in the inner circumference side of the above-mentioned primary plate 12 and back end section 11b may be located in a periphery side, respectively. Moreover, the cone-like heights 18 are formed in the core of the above-mentioned primary plate 12, and the hub cover 15 is attached in the above-mentioned primary plate 12 by tapping 21 from the upper part of above-mentioned one side-face 12a so that these heights 18 may be covered. Furthermore a boss 14 is formed in the core of the above-mentioned hub cover 15, and the shaft of the motor which is not illustrated is fixed to this boss 14. Moreover, in drawing 2, 13 is a side plate and is being fixed to each blade 11 from the upper part in drawing. In addition, 22 is the balance weight formed in the periphery of a primary plate 12, and the rib which is not illustrated for reinforcing a primary plate 12 is prepared in inferior-surface-of-tongue 12b of a primary plate 12.

[0014] The rotation drive of the turbo fan constituted as mentioned above is carried out in the direction of the arrow head R shown in drawing 2 (b) by the motor which is not illustrated. Air is inhaled by this rotation in accordance with shaft orientations from inlet port 16, and it blows off from an outlet 17 in the centrifugal direction with a blade 11. Moreover, at this time, the above-mentioned hub cover 15 formed the path of inhalation air, and the side plate 13 raised the rigidity of a blade 11, and has prevented that deformation.

[0015] Drawing 3 is the partial plan of the above-mentioned primary plate 12 really fabricated with a blade 11 and thermoplastics. And the injection-molding approach of this turbo fan is explained below using drawing 1 R> 1 which shows the shaft-orientations cross section in A-A' shown in this drawing.

[0016] Drawing 1 (a) is the fragmentary sectional view of the metal mold used for the above-mentioned injection molding. In drawing, 1 is inferior-surface-of-tongue side metal mold (metal mold for fabricating the inferior-surface-of-tongue side of a primary plate 12), and 2 is the top-face side metal mold (metal mold for fabricating the top-face side of a primary plate 12) which formed the blade hollow 9 for forming a blade 11. And the lobe 3 for forming meat NUSUMI 7 (referring to this drawing (c)) in the fabricated blade 11 is formed in the above-mentioned inferior-surface-of-tongue side metal mold 1, and the gas pipe 4 for pressing injected gas 6 (referring to this drawing (b)) fit in metal mold is further formed in it at this lobe 3. Moreover, in drawing, 5 is a knock out pin for making the fabricated blade 11 push and release from mold from the lower part of drawing.

[0017] Drawing 1 (b) is the fragmentary sectional view showing the condition in the middle of injection molding of the turbo fan which used the above-mentioned metal mold 1 and 2. It is made to flow from the direction which shows the thermoplastics 10 injected from the injection nozzle which is not illustrated by the metal mold set as shown in this drawing (a) to an arrow head B or B'. Since the above-mentioned lobe 3 is formed in the inferior-surface-of-tongue side metal mold 1 at this time, the part used as the heavy-gage part of mold goods decreases conventionally, therefore it can equalize and the fluidity of thermoplastics 10 can perform the uniform resin inflow covering the whole metal mold. And if this resin inflow is completed, it will

press fit from the direction of the arrow head C which shows injected gas 6 in drawing from the above-mentioned gas pipe 4 below. By this press fit, since thermoplastics 10 can be certainly stuck even to a part for the point of the blade hollow 9 of the top metal mold 2, a dwelling process can be skipped, cycle time can be shortened and improvement in productivity can be aimed at.

[0018] moreover, the above-mentioned lobe [in / although the height of the above-mentioned lobe 3 was not highly made from the problem of metal mold reinforcement, therefore meat NUSUMI 7 was conventionally prepared only for root Motobe of a blade 11, since this problem is mitigated by skipping a dwelling process as mentioned above / this metal mold] 3 -- about [of the depth of the blade hollow 9] -- it has prepared even in two thirds. And forming meat NUSUMI 7 even in the depth of the abbreviation 2/3 of the height of a blade 11 by this can attain lightweight-ization by reduction of **** and the amount of resin. Moreover, it is common to become thicker than the diameter of a metal mold dice according to a Barus effect, or to hang down with a self-weight, to get down, to cause a phenomenon, and to become thin after that, when the fused resin is extruded from metal mold in shaping using a blow molding method, and it is difficult to obtain the mold goods which have a predetermined thick dimension correctly. Therefore, in the conventional turbo fan which attained lightweight-ization using the blow molding method, since the ** balance at the time of rotation was unstable, there was a problem that fundamentality ability, such as a noise property, deteriorated. however, this turbo fan -- setting -- above -- about [of the height of a blade 11] -- since meat NUSUMI 7 which has two thirds of the depth is formed and it is made to carry out blow molding only of the point from this, though the same lightweight-ization as the turbo fan by the conventional blow molding is attained, ** balance is good and can obtain the turbo fan which maintained fundamentality ability, such as noise, good.

[0019] Drawing 1 (c) is the fragmentary sectional view of the turbo fan fabricated by the above-mentioned fabricating method. Meat NUSUMI 7 of the height which has about 2/of depth of 3, and the centrum 8 produced with injected gas 6 are formed in the blade 11. And the amount of resin decreases and the turbo fan is lightweight-ized by these.

[0020] Although the concrete example of this invention was explained above, this invention is not limited to the above-mentioned example, within the limits of this invention, can be changed variously and can be carried out. For example, although the dwelling process after a resin inflow is skipped, a lobe 3 may be made to perform dwelling of extent which can be enough borne with the metal mold reinforcement. Moreover, although injected gas 6 is pressed fit from a lobe 3, this is pressed fit for example, from knock-out-pin 5 grade, and may be made to perform blow molding about the point of a blade 11.

[0021]

[Effect of the Invention] By the injection-molding approach of the turbo fan of above-mentioned claim 1, meat NUSUMI is prepared in a blade by the lobe prepared in metal mold, and it is made to carry out blow molding of the tip side with injected gas from this meat NUSUMI. Therefore, since the heavy-gage part of mold goods decreases, the fluidity at the time of a resin inflow equalizes and the resin by the side of the tip of a blade sticks to metal mold certainly with injected gas further, the need for dwelling decreases. Therefore, it becomes possible to shorten cycle time and to aim at improvement in productivity. Moreover, since the amount of resin decreases with reduction in a heavy-gage part, it becomes possible to attain lightweight-ization of the fabricated turbo fan.

[0022] Moreover, the depth of above-mentioned meat NUSUMI is made into about 1 of height of blade/2 - abbreviation 2/3 by the injection-molding approach of the turbo fan of claim 2.

Therefore, since it becomes only the point of a blade that blow molding is carried out, it hangs down, and it gets down, and the Barus effect accompanying this and the thickness deviation by the phenomenon can be reduced, and it becomes possible about fundamentality ability, such as a noise property, to maintain good considering the ** balance of the fabricated turbo fan as a stable thing.

[0023] Furthermore, with the turbo fan of claim 3, while preparing meat NUSUMI in a blade, the centrum by blow molding is prepared in the tip side from this. Therefore, while it is possible to

decrease the amount of resin and to attain lightweight-ization, since ** balance is stable, it becomes possible to maintain basic properties, such as a noise property, good.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing injection molding of the turbo fan in one example of this invention, and the fragmentary sectional view in which (a) shows the fragmentary sectional view of metal mold, and (b) shows the condition at the time of shaping, and (c) are the fragmentary sectional views of the fabricated turbo fan.

[Drawing 2] It is drawing showing the configuration of the above-mentioned turbo fan, and (a) is drawing showing the side face and longitudinal section, and (b) is a plan.

[Drawing 3] It is the partial plan showing the primary plate of the above-mentioned turbo fan.

[Description of Notations]

- 1 Inferior-Surface-of-Tongue Side Metal Mold
- 3 Lobe
- 6 Injected Gas
- 7 Meat NUSUMI
- 8 Centrum
- 11 Blade
- 12 Primary Plate

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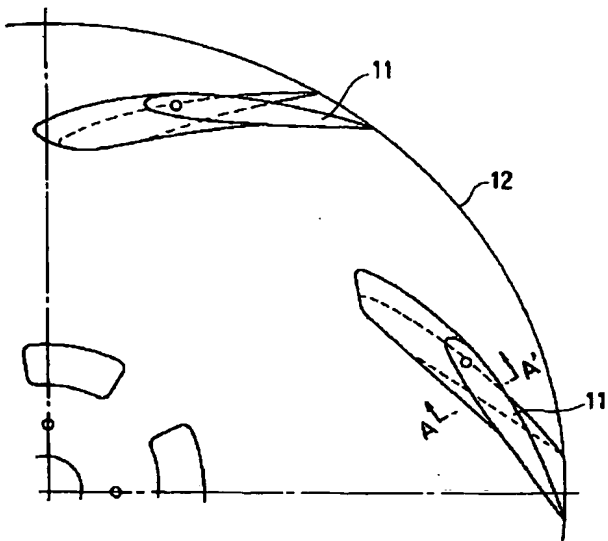
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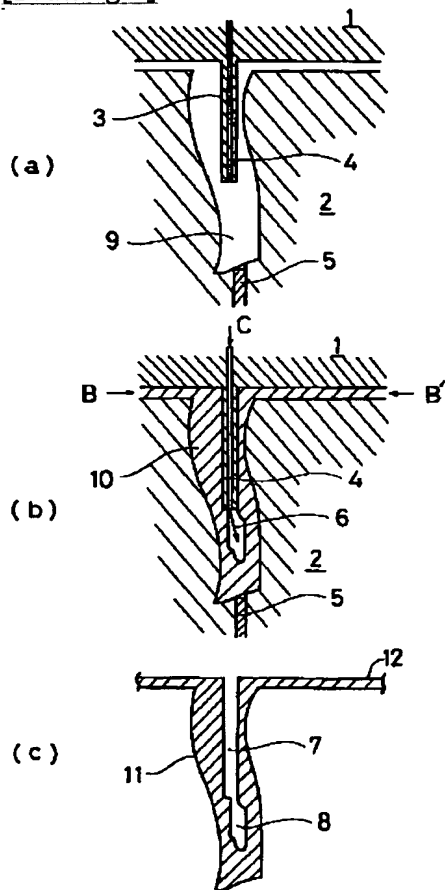
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DRAWINGS

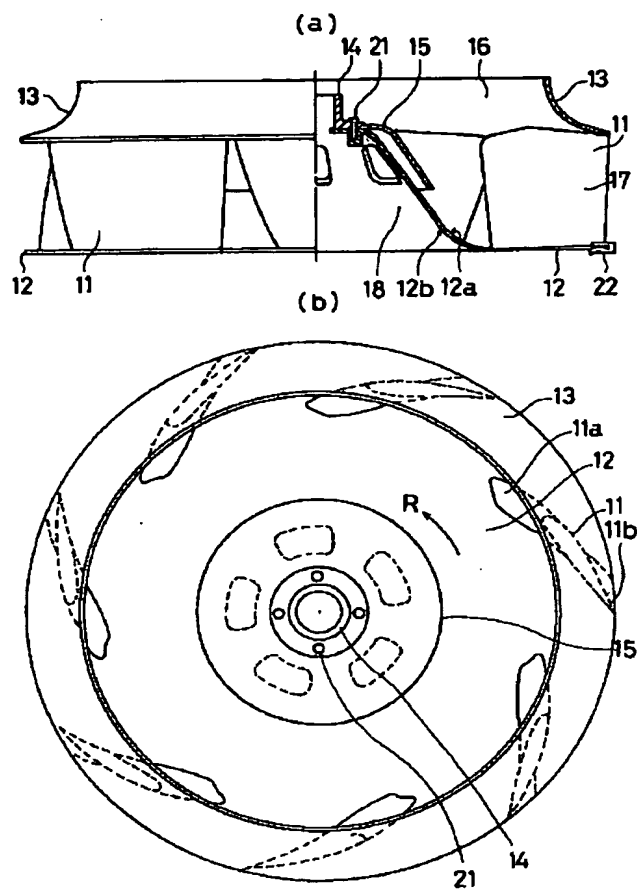
[Drawing 3]



[Drawing 1]



[Drawing 2]



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